ENERGY INFORMATION PAPER

TRENDS IN ONTARIO'S ENERGY USE

ENERGY TRENDS IN ONTARIO
A FIVE PART SERIES

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INTRODUCTION

This paper is one of a five-part series that analyzes the recent historical trends in Ontario's energy consumption, and complements the forecast for provincial energy demand contained in **Energy 2000 – The Shape of Ontario's Energy Demand.**

This paper details the trends that have emerged in total energy use in Ontario. The other papers in the series highlight energy use trends in residences, industry, transportation, and commercial and institutional buildings.

TRENDS IN ONTARIO'S ENERGY USE

Energy is a key input to a successful industrial economy. Ontario's total energy bill was about $14 billion in 1985, which represents almost one-tenth of the value of all the goods and services produced in the province.

Energy consumption in Ontario has changed a great deal over the last 15 years. First, there has been a sharp drop in the amount of energy used per unit of economic output. Second, there has been a major shift in the fuels used – a shift away from oil and toward electricity, natural gas, coal and wood.

- Between 1979 and 1985, the amount of energy used per unit of economic output was cut by about four per cent in Ontario. The economy has grown, while energy use has declined.
- Total oil use has fallen 20 per cent since 1979 and is now below the level of the early 1970s.
- Natural gas consumption has increased by 21 per cent since 1974, primarily due to the displacement of oil in residential and commercial space heating.
- Electricity consumption has increased by 38 per cent over the last decade, but the growth rate – 3.2 per cent since 1975 – is only about half the rate of the previous 15 years.

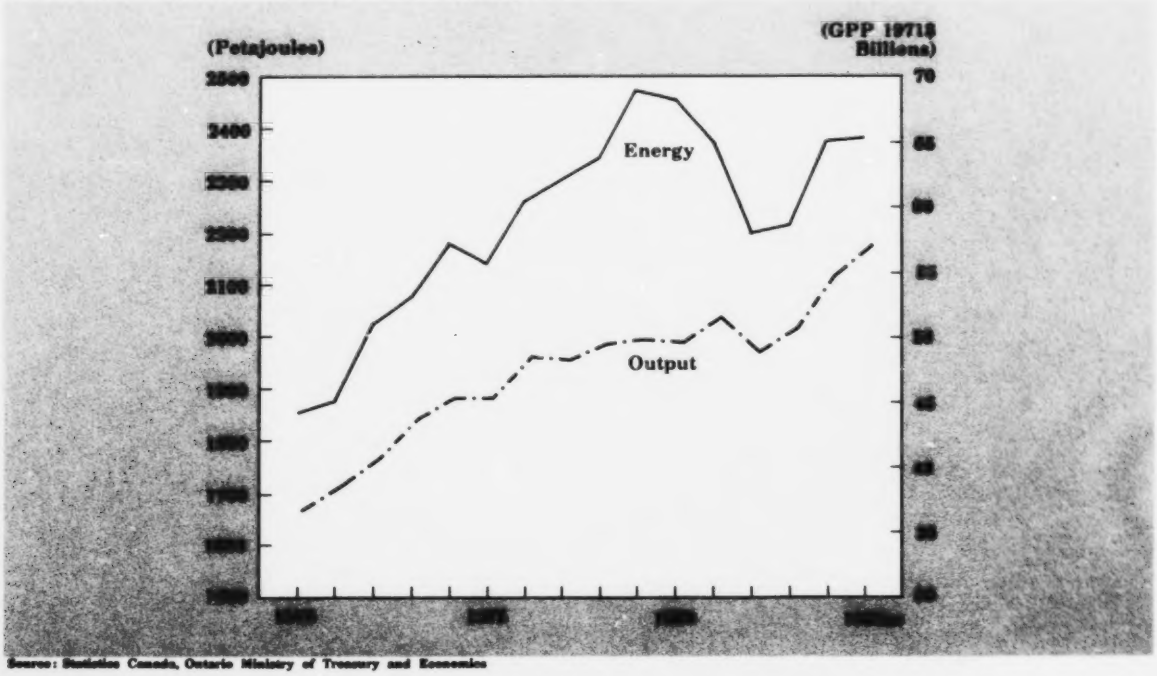
Energy Use and Economic Growth

Economic circumstances play a major role in shaping Ontario's energy requirements. What we produce, how much we produce, what we choose to consume, and what we trade with other jurisdictions exert a major force on both the quantity of energy we need, and the forms in which it is required.

Since 1970, the makeup of Ontario's economic output has shifted substantially toward providing services. Most of Canada's manufacturing, and a large portion of the resource-based industries, are heavily concentrated in Ontario. These businesses now account for about 40 per cent of the province's total economic output, and provide three jobs out of 10. Just 15 years ago, they provided about 50 per cent of our economic output and 40 per cent of employment.

"Energy intensity" is the amount of energy that is used to produce each dollar of economic output. The service sector of the Ontario economy is less energy-intensive for example, because it uses less energy per dollar of output than the goods-producing sector, which comprises manufacturing and resource-based industries. This shift to a greater proportion of services in total

ONTARIO'S ENERGY USE AND ECONOMIC OUTPUT



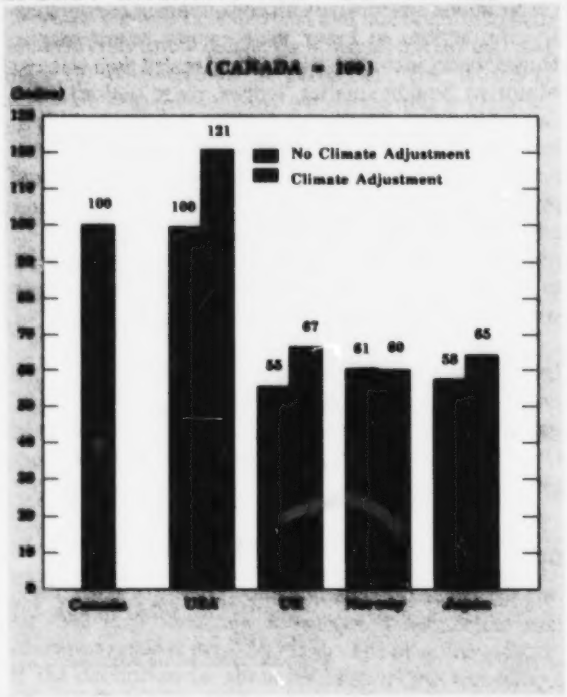
Source: Statistics Canada, Ontario Ministry of Treasury and Economics

economic output has tended to lower the province's overall requirements for energy. On the other hand, there has been substantial growth in some of the most energy-intensive goods-producing industries, growth which has offset some of the trend to decreased energy consumption caused by the shift toward greater services production.

This trend to reduce the energy content of economic output is a worldwide phenomenon in the industrialized countries. In fact, most OECD countries have exhibited greater progress than Ontario and Canada in reducing their energy intensities, if climate differences are not taken into consideration. However, if other countries had the same climate as Canada, their energy intensity would increase.

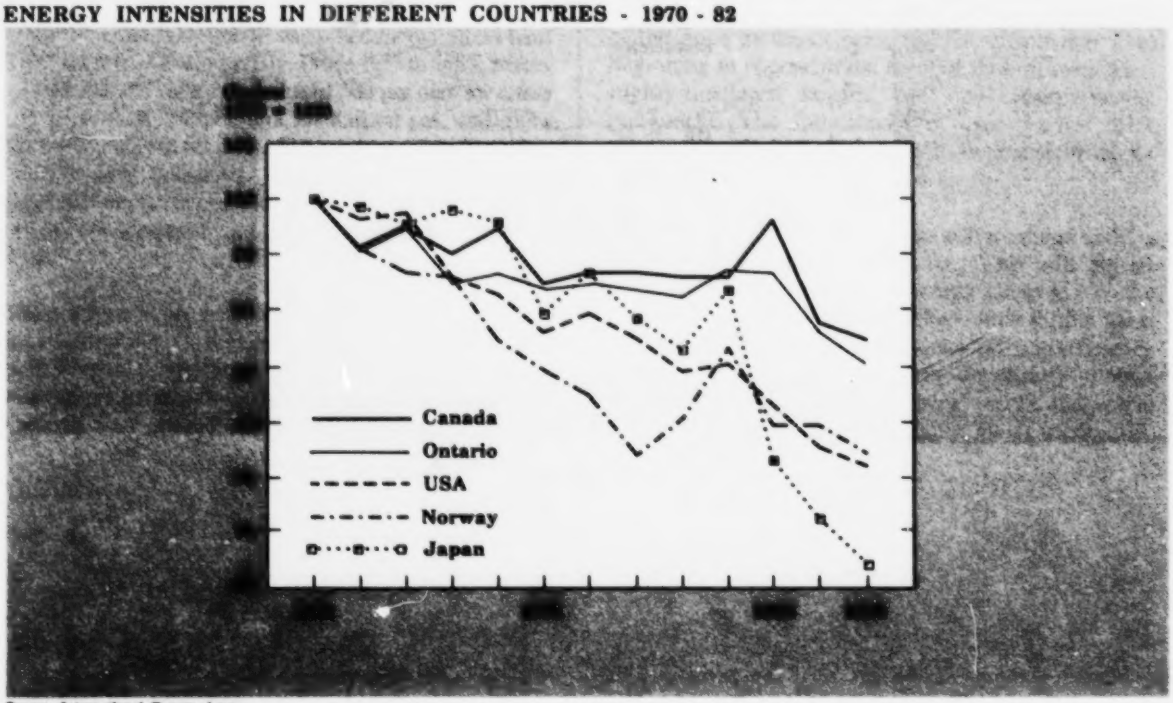
Other factors that make the Canadian and Ontario economies relatively more energy-intensive than others are the emphasis on raw materials production, which requires large amounts of energy to transport and process, and the lower population density of Canada and Ontario. More densely-populated European nations have extensive mass transit and railway systems that reduce transportation energy requirements for both people and freight.

ENERGY INTENSITY AND CLIMATE: 1982



Source: International Energy Agency

ENERGY INTENSITIES IN DIFFERENT COUNTRIES - 1970 - 82



Source: International Energy Agency

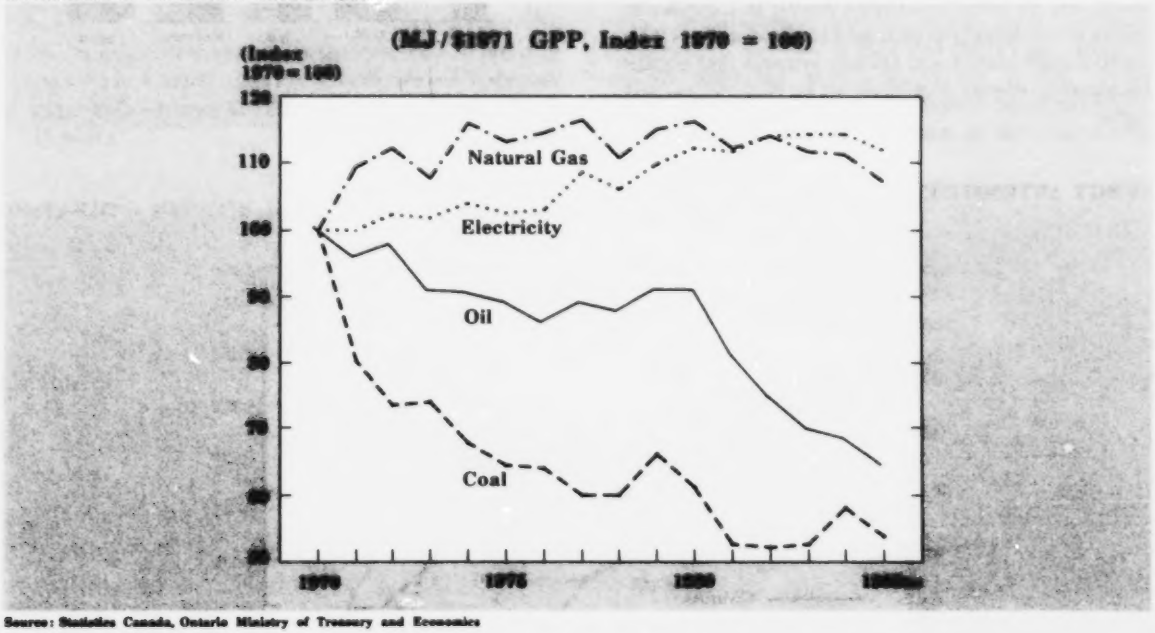
Over the period from 1973 to 1985, individuals, corporations and virtually all consumers of energy took specific actions to lower their energy requirements. Homeowners insulated, caulked and sealed their houses. Motorists bought smaller, lighter, more fuel-efficient cars. Shopping centres and office towers had their heating systems improved, and had unnecessary lighting turned off or removed. Manufacturers installed new processes and more energy-efficient equipment and educated their employees about the importance of reducing energy costs. All of these activities combined to lower the energy required to produce a growing volume of goods and services.

In 1970, it required about 19 megajoules of end-use energy – the energy content of about half a litre of gasoline – to produce one constant dollar of output in Ontario. By 1979, energy intensity had declined marginally to 17 megajoules per dollar, a reduction of 10 per cent in nine years. Between 1979 and 1985, energy intensity declined another 14 per cent, as individuals and corporations sought to counter the effects of rapidly escalating energy prices.

A comparison of end-use energy intensities by major fuel types shows that Ontario reduced its reliance on oil dramatically during the 1970-85 period. But the most rapid reduction in oil use came after 1980.

Compared to oil, the intensity with which we use other energy sources, such as natural gas, electricity, coal and other fuels, has changed gradually. While electricity and natural gas intensities have increased since 1970, coal intensity has declined. In recent years, coal use in Ontario has recovered, primarily due to an increase in steel output and some fuel switching by the cement and pulp and paper industries.

ONTARIO'S ENERGY INTENSITY



Source: Statistics Canada, Ontario Ministry of Treasury and Economics

Ontario's industries have been quite successful in reducing their energy requirements. Between 1979 and 1985, for example, Ontario's goods-producing sector (manufacturing, agriculture, mining, forestry and construction) achieved a 17 per cent reduction in their energy-output ratio. Average energy consumers also contributed to the general decline in energy intensity. Over the same period, the total energy consumed per home was down 14 per cent, and the amount of gasoline consumed per registered automobile was 15 per cent lower in 1985 than in 1979.

Energy Prices – A Turbulent Decade

In 1973-74, following the OPEC oil embargo, world oil prices quadrupled, going from U.S. $2.46 per barrel to $9.56. In 1979-81, oil prices leaped again, going from U.S. $17.84 to $29.38 per barrel, in the aftermath of the Iranian revolution. While the first price shock slowed the growth of world oil consumption, it did not fundamentally alter or reverse it, and oil use soon began to rise again. However, the second price shock spurred the Western industrialized nations to cut oil consumption by 15 per cent within five years. This reduced demand, together with increased oil supply, resulted in a glut of oil on world markets, one that seems likely to persist for several years.

In Ontario, the prices of oil and other energy forms have changed just as dramatically. From 1973 to 1985, prices rose swiftly in real terms – almost 300 per cent for crude oil, more than 200 per cent for natural gas, and more than 100 per cent for coal. Electricity prices also rose, by just over one-third. Consumers and businesses responded to these price increases by cutting their total energy consumption, and by switching from oil to other fuels.

The price increases were not the only reason for the drop in consumption. Government programs played a major part. Federal programs for home insulation (CHIP) and heating oil substitution (COSP) were introduced, and Ontario also offered extensive programs for energy conservation and oil substitution. These programs provided incentives, expertise, and information to help Ontario consumers reduce their overall energy use, and their oil consumption in particular. The 1981-1982 recession also dramatically cut energy use in Ontario, and particularly by industry.

Table 1: Ontario's Energy Price Changes

([illegible] per Gigajoule)*

	[illegible]	[illegible]	% Change
Crude Oil	1.64	6.40	290
Natural Gas	1.24	3.88	211
Coal	1.21	2.58	111
Electricity	7.66	10.50	37

*A gigajoule (GJ) is one billion joules or the energy contained in 29 litres of gasoline.

When Ontario's energy demand dropped 12 per cent in the 1982 recession, some 40 per cent of the decline was as a direct result of price increases. The other three-fifths of the decline came about because of the recession, which had a tremendous impact on Ontario's industry and transportation sectors. As well, much of the price-induced drop in consumption was in fact a delayed effect of the price increases prior to 1979, effects that were beginning to appear in the form of fuel-efficient cars, highly-insulated houses and new energy-saving equipment. The full impact of these earlier price changes for oil and natural gas will continue to be felt for many years.

Since early 1986, oil and gas prices have come under a great deal of downward pressure. This will almost certainly lead to increased energy demand, as the economy expands. It will also tend to limit further gains in conservation. However, any slow-downs in efficiency improvements should prove to be temporary – unless there is a sustained collapse in energy prices, and people once again begin to feel complacent about energy use.

Changing Fuels

Over the past 15 years, the share of the energy end-use market held by different fuels has changed marginally. 'End-use energy' is energy that is consumed at the point of use – in furnaces, car engines, lights and industrial boilers – plus the so-called 'non-energy use', which is mainly oil used for petrochemical feedstocks and products such as lubricating oils, waxes and asphalt.

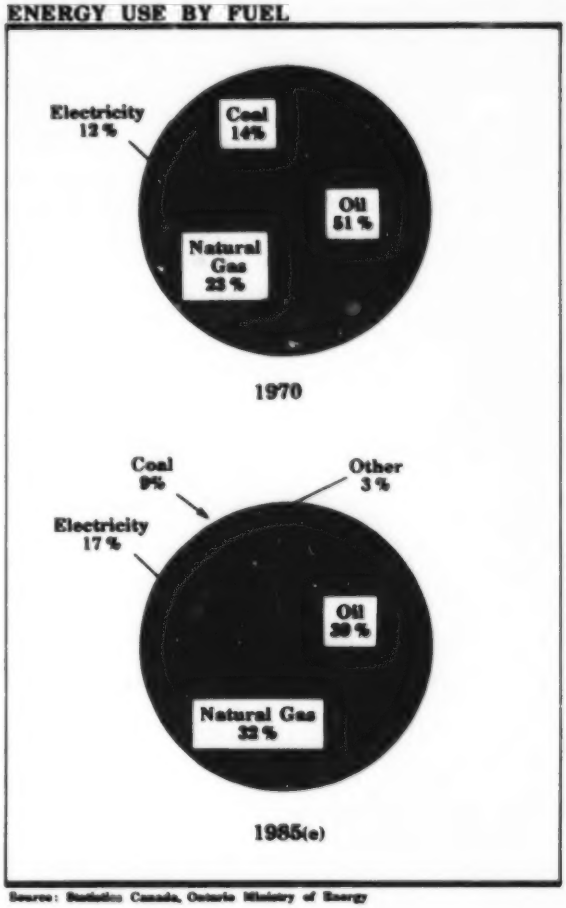
Table 2: Ontario's End-Use Energy

Oil	1,016	49	1,165	47	[illegible]	[illegible]
Natural Gas	564	27	695	28	760	32
Electricity	278	13	341	14	389	17
Coal	225	11	269	9	214	9
Other	0	0	56	2	84	4
Total	2,083	100	2,476	100	2,385	100

*A petajoule (PJ) is a measure of the heat content of a fuel. One petajoule is one quadrillion joules (10^{15}), or the amount of energy in 29 million litres of gasoline.

In Ontario, oil's share of end-use energy fell to 39 per cent in 1985 from almost 50 per cent in 1973. Most of the reduction occurred after 1979. After the implementation of the National Energy Program and the Canada-Alberta Agreement of 1981, oil prices were allowed to approach world levels more quickly, and oil consumption fell in reaction to increased prices. Natural gas use has increased from 27 to 32 per cent since 1970, while electricity use has increased from 13 to 17 per cent. As

ENERGY USE BY FUEL



Source: Statistics Canada, Ontario Ministry of Energy

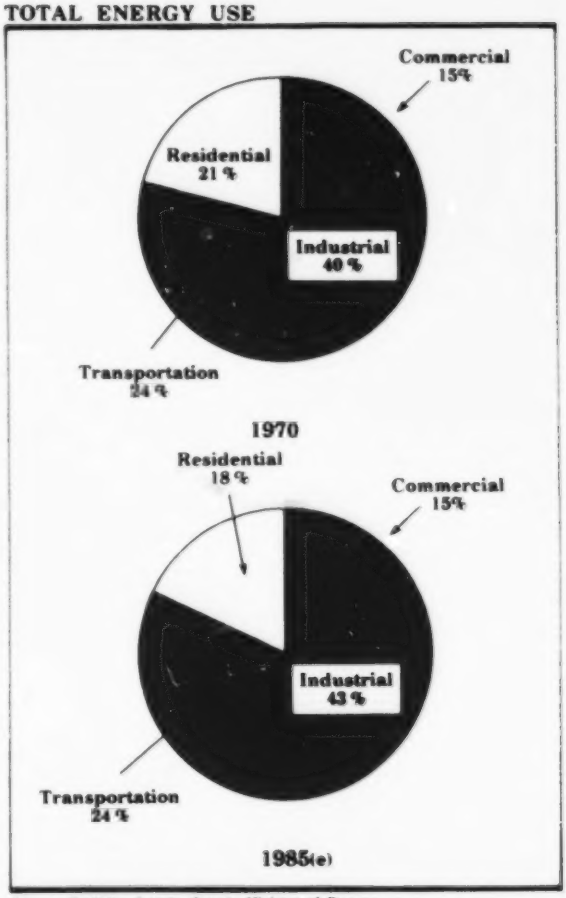
well, the use of alternative fuels, such as wood, went to 3 per cent in 1985 from almost zero in 1973. Coal use decreased slightly from 11 to 9 per cent over the same period.

In 1985, homes accounted for about 20 per cent of energy use, and commercial and institutional buildings for about 15 per cent. In Ontario, industry is our biggest energy user, consuming about 40 per cent of our end-use energy. Industry is followed by transportation, which accounts for about 25 per cent.

This mix of energy demand from the various sectors is not very different from the situation in the early 1970s, except that the share taken by the residential market has been reduced by conservation. The relative importance of industrial markets varies from year to year, depending on the level of industrial activity.

Healthy economic growth depends on the competitiveness of our resource, manufacturing and high-technology industries in international and domestic markets. While some of the factors affecting these industries are not controllable – world commodity prices and trade barriers, for example – other factors are. The progress made in reducing the amount of energy needed to produce Ontario's goods and services is an excellent example of how industries and individuals can counteract unfavourable events that are beyond their control. However, there is still much more to be done to improve Ontario's energy efficiency, and to ensure a secure energy and economic future.

TOTAL ENERGY USE



Source: Statistics Canada, Ontario Ministry of Energy

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